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| APPLICATION NO | FILING DATE | FIRST NAMED INVENTOR | ATTORNEY DOCKET NO | CONFIRMATION NO |
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| 09/974,043 | 10/09/2001 | Jeremy Barker | 4858-000021/CPE | 7904 |

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| EXAMINER | |
|---|---|
| VIJAYAKUMAR, KALLAMBELLA M | |

| ART UNIT | PAPER NUMBER |
|---|---|
| (751) | |

DATE MAILED: 06/04/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

| Office Action Summary | Application No. | Applicant(s) | |
|---|---|---|---|
| | 09/974,043 | BARKER ET AL. | |
| | Examiner | Art Unit | |
| | Kallambella Vijayakumar | 1751 | |

-- *The MAILING DATE of this communication appears on the cover sheet with the correspondence address* --

**Period for Reply**

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

**Status**

1)☒ Responsive to communication(s) filed on *12 April 2004*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

**Disposition of Claims**

4)☒ Claim(s) *45-69* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *45-49, 51-52, 54-69* is/are rejected.

7)☐ Claim(s) *50,53 and 58* is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

**Application Papers**

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

**Priority under 35 U.S.C. § 119**

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

**Attachment(s)**

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date *04/04; 01/02*
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____

## *Detailed Action*

- This is a CIP of S1 No. 09/707100 filed 11/6/2000, now US Patent 6,555,026.
- Acknowledge the amendment filed 04/12/2004 canceling claims 1-44 and addition of new claims 45-69 in response to the restriction requirement by the office mailed 03/25/2004. Claims 45-69 are currently pending with the application.
- Acknowledge the IDS received 04/12/2004 and 01/29/2002 and consideration of the same by the examiner.

## *Claim Objections*

- Claim 58 is objected to because of the following informalities:

  The claim has been misnumbered as there are two claims with the same numbers.

  Misnumbered claim 58 been renumbered 59 for the purposes of examination.

## *Claim Rejections - 35 USC § 102*

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (a) the invention was known or used by others in this country, or patented or described in a printed publication in this or a foreign country, before the invention thereof by the applicant for a patent.
>
> (b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States
>
> (e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

1. Claims 45-49, 51-52, 54-58 and 60-69 are rejected under 35 U.S.C. 102(e) as being anticipated by Howard, Jr. et al (US Patent 6,558,844) in view of Amatucci et al (Solid state Ionics, (1997), V104, pp 13-25).

Normally, only one reference should be used in making a rejection under 35 U.S.C. 102. However, a 35 U.S.C. 102 rejection over multiple references has been held to be proper when the extra references are cited to (SEE MPEP 2131.01):

(A) Prove the primary reference contains an "enabled disclosure,"
(B) Explain the meaning of a term used in the primary reference, or
(C) Show that a characteristic not disclosed in the reference is inherent

Howard Jr. et al disclose a stabilized spinel cathode for a lithium battery formed by heat treating a cubic spinel lithiated spinel manganese oxide of the formula $Li_{1+x}Mn_{2-x}O_4$ {Instant Claims-45, 66) with a lithium salt {Instant Claims- 54, 55, 58, 60, 61, 62} in air between 350-850°C {Instant Claim-54, 65}, and reacting the lithium salt with the surface of the spinel particles {Instant Claim-63, 64} followed by cooling the product to below 200°C. The spinel composition of the core underneath the protective coating of stable $Li_2MnO_3$ {Instant Claims-45, 48, 49, 51, 52, 54, 55, 58, 61, 62} formed would have the '**x**' values less than 0.2 {Instant Claims 46-47}.

The $Mn^{4+}$ enrichment on the outer surface of the stabilized cubic spinel of lithiated manganese oxide {Instant Claim-45, 54}, the lattice constants/parameters {Instant Claims 56-57} and the surface oxidation of the spinel and surface enrichment with Li {Instant claims 63-64} would either be anticipated or be inherent, because the reactant compositions, and preparative method and conditions used by Howard Jr et al are almost identical to those claimed by the applicants in the instant claims.

The precursor composition in Table-2 would meet the limitation of Instant Claim-66; the lithium carbonate would meet the limitation of instant claims 58 and 62. The coin cell and its discharge data in Table-2 would meet the limitation of a battery in all the instant claims.

The lattice constant data in Figure-1 of Howard Jr. et al would meet the limitation of instant claims 56 and 57 in view of a lattice constant of less than 8.230Å reported by Amatucci et al for the stabilized lithiated manganese cubic spinel oxide formed by the reaction of the Li/Li-Salt at the surfaces of the spinel and obtained by heating a mixture of $Li_{1.05}Mn_{1.95}O_4$ and $LiOH.H_2O$ between 600-800°C {Amatucci: Page-16, Paragraphs 1-2}, wherein in the composition of the reactants and the method of making the stabilized lithiated manganese oxide for the positive electrode of a rechargeable alkaline battery used by Amatucci et al and Howard Jr. et al were identical to those claimed by instant claims by the applicants, and this would meet the lattice parameter limitations in the instant claims 56-57. (US #844: Abstract, Figure-1, Col-2, Lines. 26-31; Col-2, Line-65 to Col-3, Line-33; Col-5, Lines: 34-59, Col-6, Table-1; Col-7, Lines: 48-52, Col-8-9, Table-2). The use of a Li-intercalation active anode such as Li-alloys or graphite and the electrolyte comprising normal solvents such as EC and PC per the limitation of instant claims 67-69 would have been anticipated in a rechargeable Lithium Battery. All the limitations of the instant claims are met.

The reference is anticipatory.

2. Claims 45-49, 51-52, 54-55, 58, 60, 63-64, 66-69 are rejected under 35 U.S.C. 102(b) as being anticipated by Yamamoto et al (EP 0 589294 A1).

Yamamoto et al disclose a non-aqueous lithium battery having a positive electrode formed from a spinel composite powder consisting of $Li_{1-x}Mn_2O_4 - (0 \leq X \leq 1)$, and formed on the surface of each of the particles constituting the powder, a layer of $Li_2MnO_3$, a negative electrode of lithium alloys or carbon materials, and an electrolyte of lithium salts in organic solvents such as PC, EC and BC. The composite spinel was formed by heating a mixture of lithium hydroxide and $LiMn_2O_4$ spinel that is almost identical to the limitations of the instant claims by the applicants (Abstract, Col-1, Line-47 to Col-2, Line-52), and this would meet the limitations of instant Claims-45-49, 51-52, 54, 58, 60, 64, and 66-69. The occurring of oxidation to $Mn^{4+}$ at the surface of the cubic spinel lithiated manganese oxide particles in instant claim-53 would be inherent by virtue of $Li_2MnO_3$ formation on the surface of $LiMn_2O_4$ and the insertion of Li into lattice at surface sites. All the limitations of the instant claims are met.

The reference is anticipatory.

## *Claim Rejections - 35 USC § 103*

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

The factual inquiries set forth in *Graham* v. *John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

3. Claims 45-49, 51-52, 54-69 are rejected under 35 U.S.C. 103(a) as being unpatentable over by Howard, Jr. et al (US Patent 6,558,844) in view of Amatucci et al (Solid state Ionics, (1997), Vol-104, pp: 13-25) and further in view of Furukawa et al (EP 0 265950).

The disclosure on the composition, method of making, the battery and characteristics by Howard, Jr in view of Amatucci et al is set forth as above over the Claims Rejection-1 under USC 102(e).

Howard Jr. teaches all the elements of the instant claims, but does not explicitly disclose the use of Li-intercalating anodes such as graphite and the electrolyte dissolved in selective solvents per the instant claims although they could been obvious.

Amatucci et al fabrication of batteries comprising Graphite Anode/ Liquid electrolyte of 1M-$LiPF_6$ in 2EC:DMC/Spinel Cathode/Li-ion batteries {Page-19, Paragraph-2} using stabilized lithiated manganese oxide as the cathode material.

Furukawa et al teach the use of various lithium salts in the preparation of active positive material comprising $Li_2MnO_3$, its advantages, and batteries comprising Li-intercalation anodes and electrolytes containing a solvent of PC: dimethoxy ethane (Claims 3, 9, and 11).

It would have been obvious to one of ordinary skill in the art to modify the cell composition of Howard Jr. et al by optionally making use of Li-intercalating anodes such as Li-alloys or graphite that are well known in the art at the time of invention per the teachings of either Amatucci et al or Furukawa et al to benefit from improved charge-discharge-fade characteristics of the battery at higher temperatures of operation; and/or use other traditionally used salts of alkaline metals in the stabilization of lithiated manganese spinel oxide of Howard, Jr et al per the teachings of Furukawa et al to benefit from ease of making and associated varied properties of the modified spinel, because all the teachings are in the analogous art of rechargeable alkaline batteries, and with the expectation of reasonable success in arriving at the limitations of the instant claims by the applicants.

4. Claims 45-49, 51-52, 54-55, 58-64 and 66-69 are rejected under 35 U.S.C. 102(b) as being anticipated by Yamamoto et al (EP 0 589294 A1) in view of Furukawa et al (EP 0 265950).

The disclosure on the positive electrode composite composition, method of making, the battery and characteristics by Yamamoto et al is set forth as above over the Claims Rejection-2 under USC 102(b).

Yamamoto et al do not disclose the use of other alkali metal salts in the preparation of the positive electrode composite composition.

Furukawa et al teach the use of various lithium salts in the preparation of active positive material comprising $Li_2MnO_3$, that is the same material on the surface of the composite of Yamamoto et al, and batteries comprising Li-intercalation anodes and electrolytes comprising a solvent of PC: dimethoxy ethane (Claims 3, 9, and 11).

It would have been obvious to one of ordinary skill in the art to modify the cell composition of Yamamoto et al by optionally using other traditional salts of alkali-metals known in the art for the stabilization of lithiated manganese spinel oxide with the teachings of Furukawa et al to benefit from varied properties of the modified spinel, because both the teachings are in the analogous art of rechargeable alkaline batteries, and with the expectation of reasonable success in arriving at the limitations of the instant claims by the applicants.

## *Allowable Subject Matter*

- Claims 50 and 53 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

The following is a statement of reasons for the indication of allowable subject matter: The prior art of record neither teaches nor fairly suggestive of a battery comprising of Na2MnO3 meeting the limitations of the instant claims by the applicants.

## *Conclusion*

- The prior art made of record and not relied upon is considered pertinent to applicant's disclosure. Kanai (US Patent 6,103,422), Yamamoto et al (JP 07-262984), Sugiyama et al (JP 2002-124258) and Thackery et al (Abstract 11, IMLB 12 Meeting of The Electrochemical Society, Inc. 2004).

- Any inquiry concerning this communication or earlier communications from the examiner should be directed to Kallambella Vijayakumar whose telephone number is 571-272-1324. The examiner can normally be reached on M-Th, 07.00 - 16.30 hrs, Alt. Fri: 07.00-15.30 hrs.
- If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Dr. Yogendra Gupta can be reached on 571-272-1316. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.
- Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

KMV
May 27, 2004.

Mark Kopec
Primary Examiner